ECE 1778 – Creative Applications for Mobile Devices

Money Jars Final Report

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Word Count 2490 (Excluding Headings, Pictures & Words in Pictures, and References)

1. Introduction

Background & Why

> *"Financing literacy is having the knowledge and skills needed to make responsible economic and financial decisions with competence and confidence".*
> *(Ministry of Education, 2010).*

Financial literacy causes anxiety in most people, yet it's a core life skill for participating in modern society and increasingly complex world. Low levels of financial literacy have been associated with a lower standard of living, psychological and physical well-being (OECD, 2012). The global recession in 2008 highlighted the importance of financial literacy (Ministry of Education, 2010).

To improve financial literacy in adults, we should teach children about money as soon as possible ideally when they start formal schooling (OECD, 2012). One criticism of the current state of financial education, which primarily targets high school students, is that it comes too late, after "habits have been formed and social and familial influences have already taken hold" (Batty et al., 2015). This is consistent with established literature that childhood variables are generally to have a lifelong impact on the behavior of adults (Econstor, 2015).

If misconceptions or negative behaviors are not addressed early enough, this may persist into adulthood *despite* finance education later (Meszaros & Evans, 2010) making early financial literacy education to children even more important.

What

The goal of the Money Jars app is to teach elementary aged children (ages 6-10) about financial literacy by tracking their money through three digital money jars of spending, saving and sharing.

To create a safe environment, the money being tracked in the app is real but guaranteed by the parents. For cash inflows, the child will physically give the cash to the parent before updating the app. For outflows, the parent will pay for the item and the child will update the app.

Main Feature

The main feature of the Money Jars is the three money jars because it is well known that spending, saving and sharing are core values of financial literacy.

a) Spending is the idea of scarcity and that money does not grow on trees; children must realize that we face money limitations and this mean making choices (Brown & Ferguson, 2017) for short-

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term purchases. Money Jars teaches about choices because it allows children to decide how to spend their money, but the amount is limited to the amount of money the child has in the spending money jar.

b) Saving is the idea that money can be put aside for the future or long-term purchases and is tied to goal-setting (Brown & Ferguson, 2017). Money Jars allows the child to set its own financial goal, which is important for the child's learning. To encourage savings behavior, the child cannot spend money from the savings jar until the financial goal is achieved.

c) Sharing is the idea of spending money on others and not on yourself. It is about encouraging altruistic behaviors in children, so it will benefit society in the long-term (Brown & Ferguson, 2017). To encourage sharing behavior, the child can spend money from the savings jar on others, not him/herself.

Other Features

a) Money Jars has a parent and child login because financial socialization by the parents has the highest positive influence on financial literacy for children (Econstor, 2015). Two logins will increase interaction and engagement between parent and child. Although a collaborative approach between parent and school is always optimal, but since the biggest positive influence on a child's financial literacy is the parent, accordingly the parent plays the most critical role

b) Since financial literacy and numeracy skills are highly positively correlated (Econstor, 2015), Money Jars integrates numeracy learning by making the child do the math correctly before confirming a financial transaction.

c) Money Jars not only allows children to set their own financial goals but also how to allocate one-time gifts between the three jars because they learn best if they can make their own decisions (Geiger et al. 2014).

d) The famous 1972 marshmallow test shows that children are focused on now and instant gratification. Because saving and sharing behaviors are harder for them to learn, parental guidance is required. Accordingly, the parent determines how to allocate allowance between the three jars in Money Jars.

e) To encourage saving and sharing behaviors, children can only transfer money from the spending jar to saving and sharing jars, and not the other way around. Money can only be used from the saving jar if the financial goal is reached and sharing jar for others.

f) Money Jars helps children understand the implications of their financial decisions by providing balance statements.

g) Money Jars have financial lessons/tips for both parent and child. This is important because parents may not have the appropriate knowledge to teach their children since approximately 50% of adults have relatively low levels of financial literacy (Financial Agency of Canada, 2011).

2.   Statement of Functionality

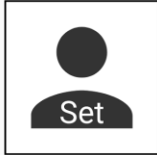The following describes the functionalities of the app and shows the corresponding screenshots.

2.1 Login

When a user opens the app, the user can either register a new account or log in with credentials. Note that a child account can only be registered within a parent's account.
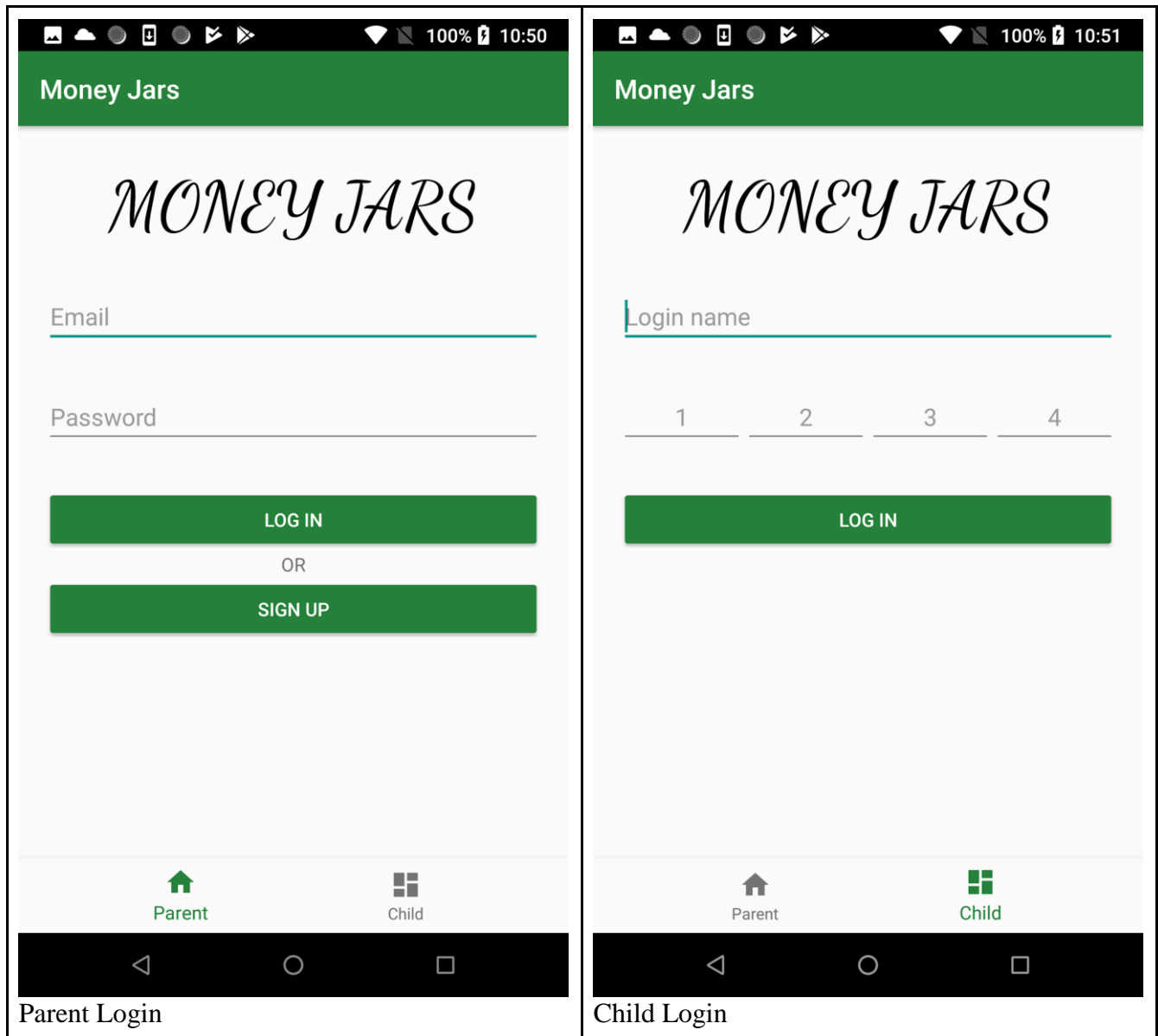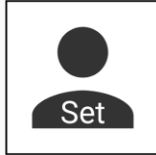
Parent Login	Child Login

Parent Login

Child Login

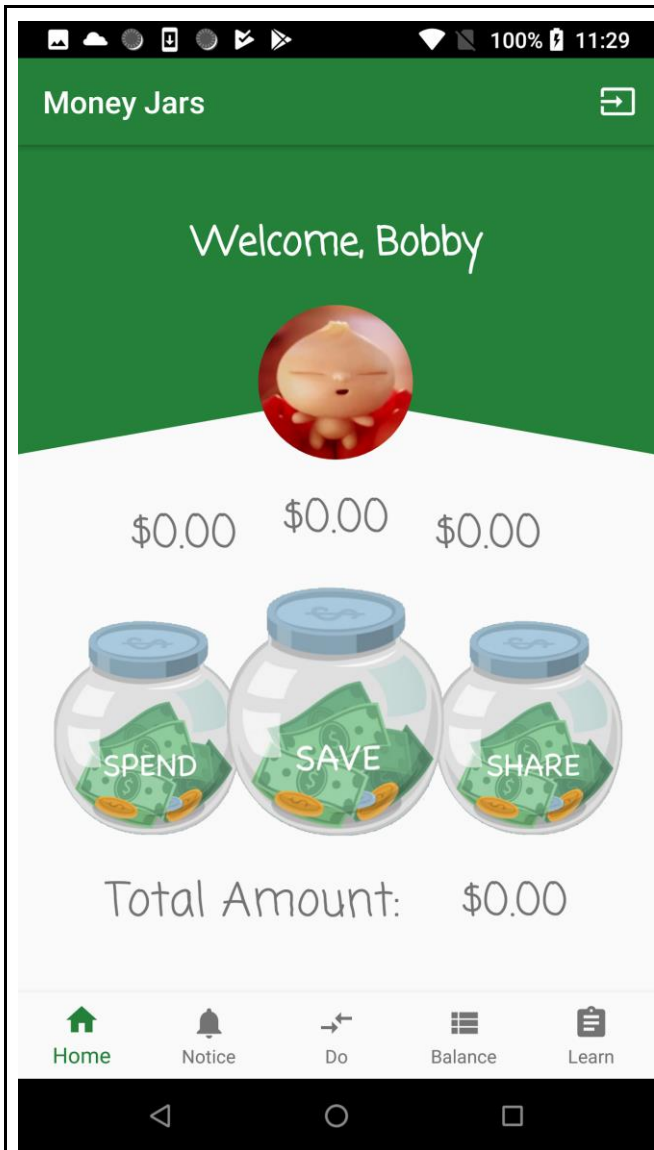| Parent Registration | Child registration |

2.2 Profile

After a parent or a child logs in, the app shows the profile page. If the parent has not register for his child, he is encouraged to click the button to register. Otherwise, the parent will see the money jars with the balances.
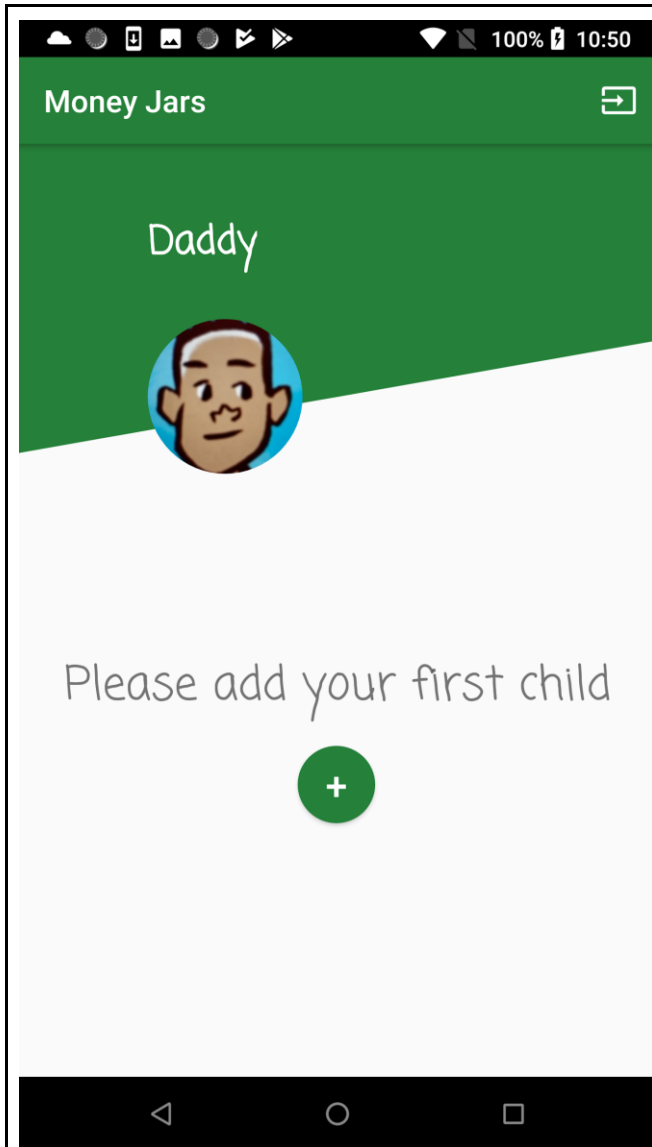
| Parent profile without a child | Parent profile with a child |

Child profile

2.3 Parent Operations

A parent can send a one-time gift or setup a periodic allowance. The parent needs to fill out the amount and the description for sending a one-time gift. Similarly, the parent needs to fill out the necessary information to set up the allowance.
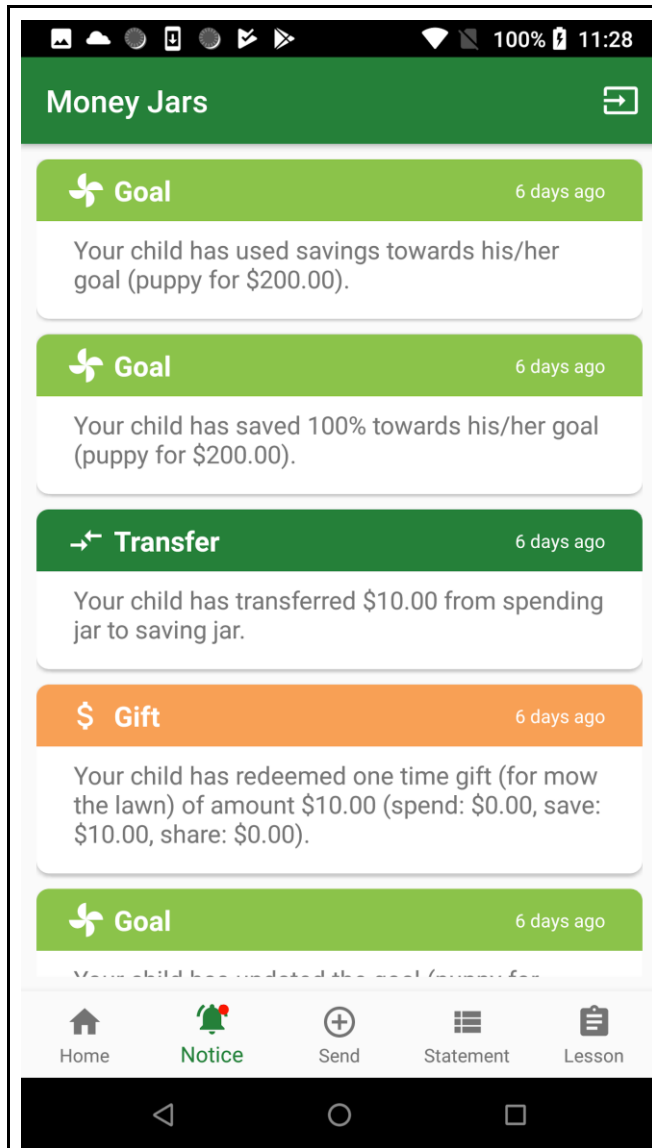

| One-time gift Form | Allowance Form |

2.4 Notifications

A parent can see various notifications from his child including transfer of money, use of money, goal complete, goal setup, etc. A child will receive notifications including one-time gift, allowance, goal completion. Additionally, the child can swipe left on the notifications to get the money by calculating numbers.

Parent notifications
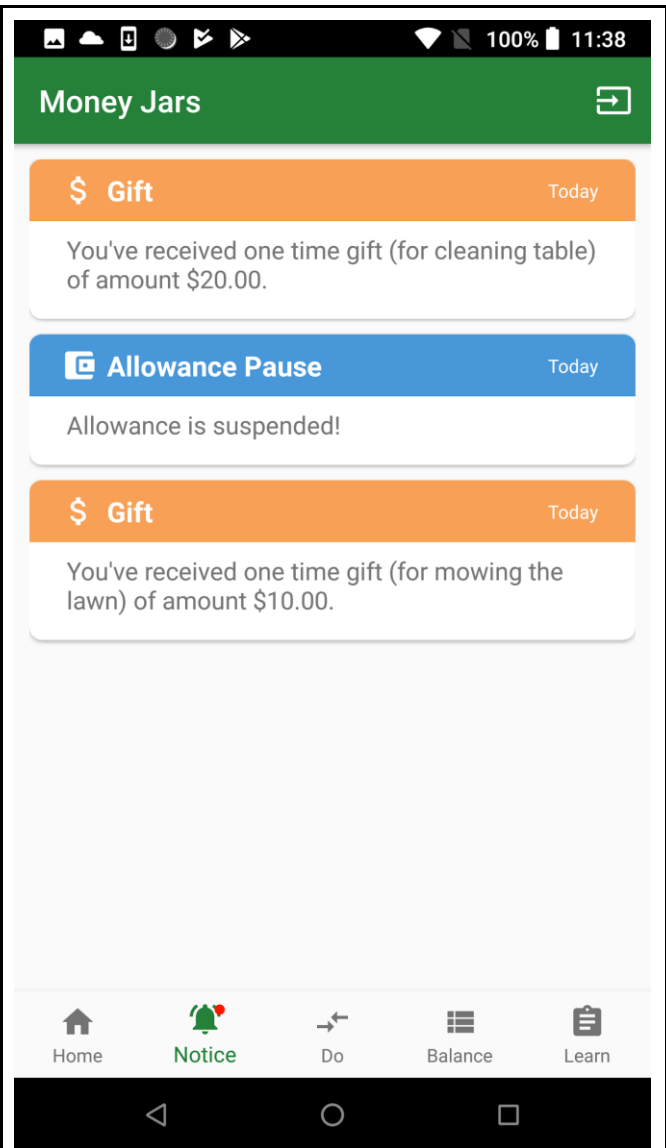
Child notifications

Distribute money to get one-time gift

Calculate sum to get allowance

2.5 Transfer and Use Money

A child can use or transfer money between money jars. The child can drag the coin beside the spending money jar onto saving or sharing money jar to transfer money. He can also click on the money jars to use the money. Both use and transfer require doing calculation successfully.
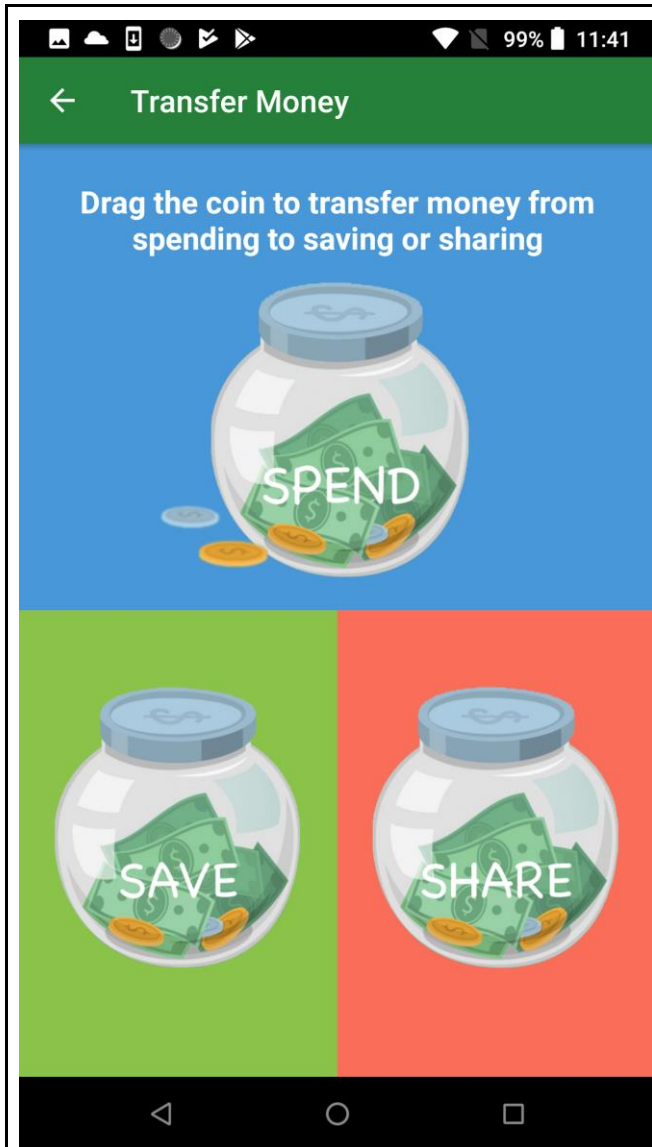
Transfer money
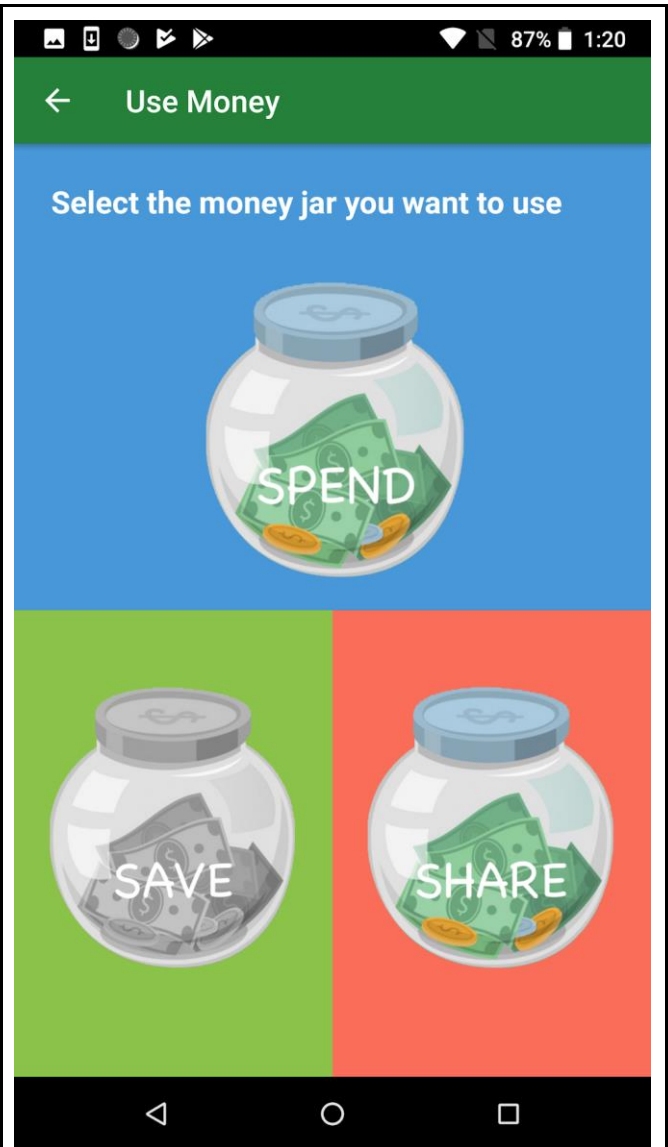
Use money
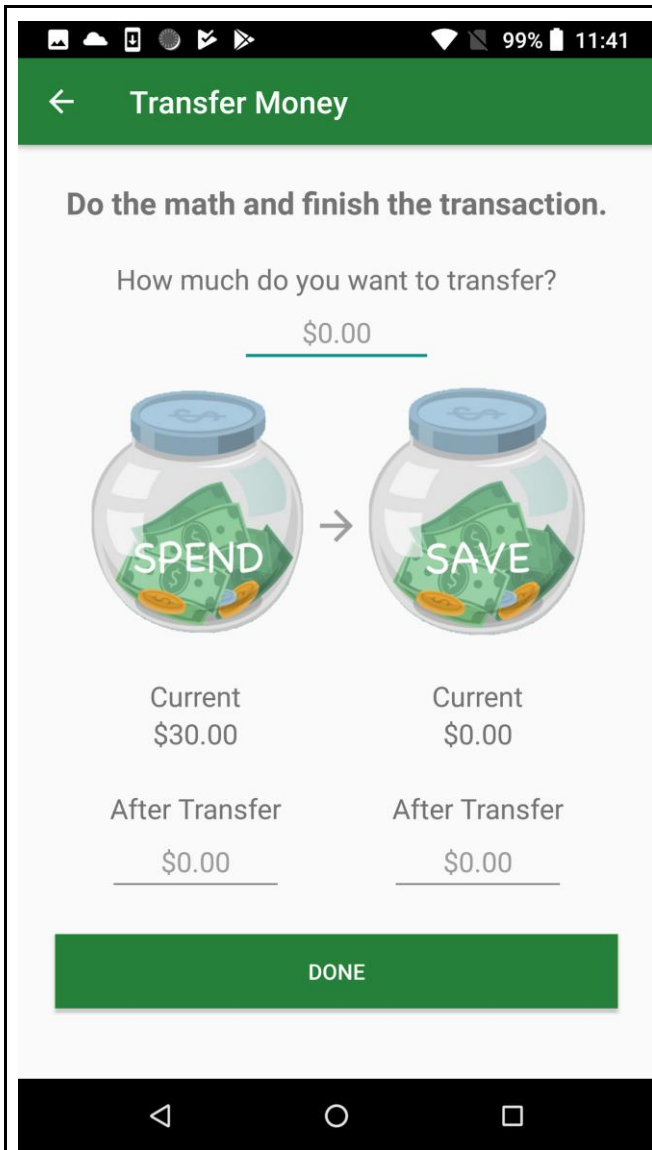
Transfer money calculation
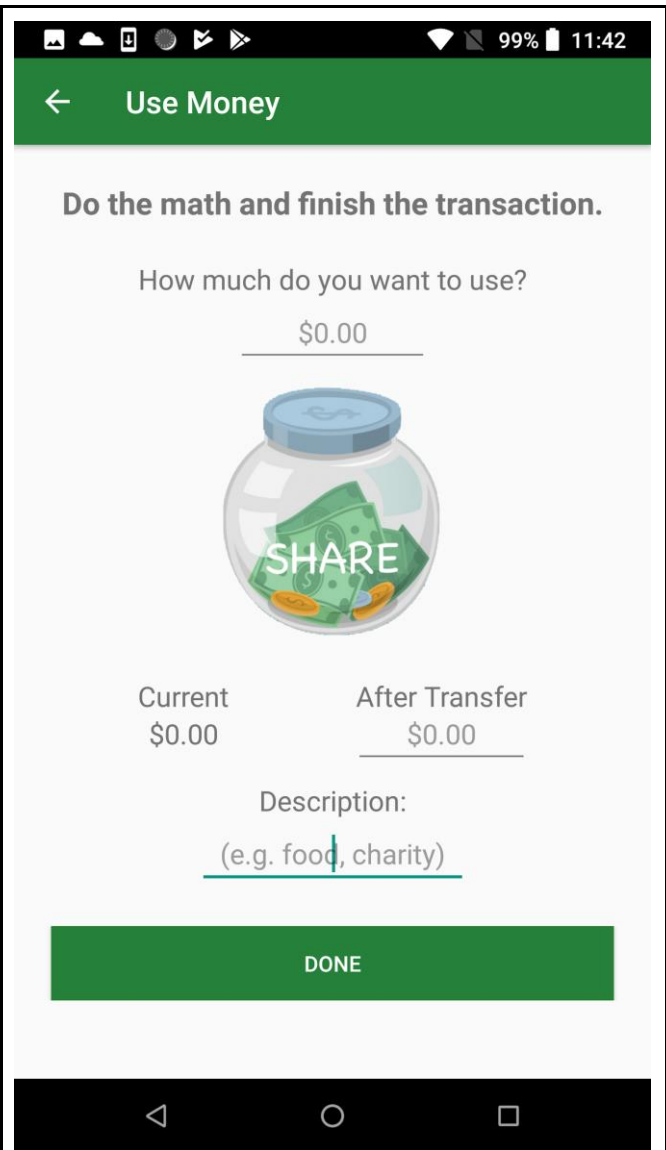
Use money calculation

2.6 Financial Goal

A child can fill out the goal form to specify the goal. After the child saved targeted money, he would be able to get his goal by filling out the redemption form. Goal setup, completion, and redemption will all trigger the app to send notifications. The child can also change or delete the goal.

Goal setup form	Goal in progress
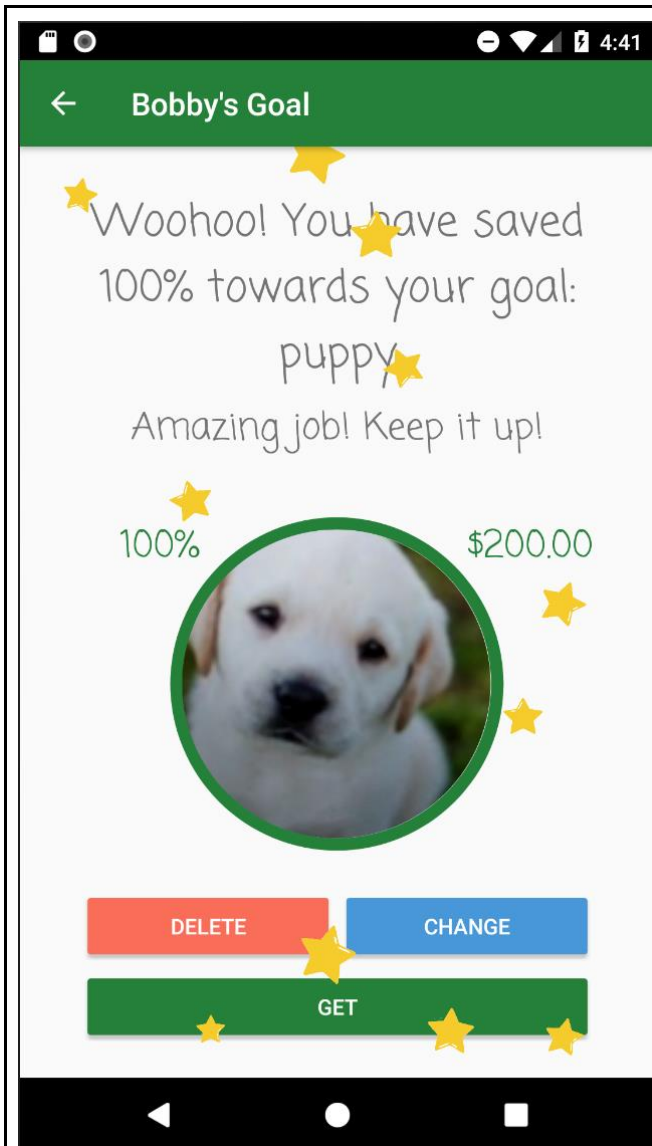
Goal completion
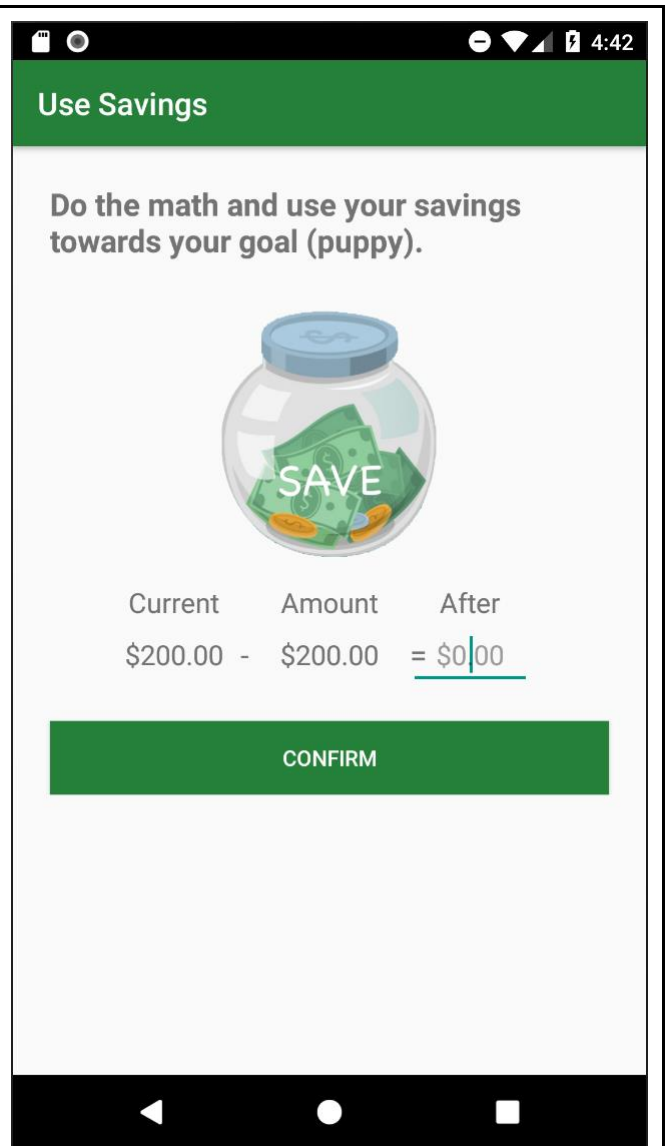
Goal redemption form

2.7 Balance Statements

Both parent and child can check the balance statements of each money jars. Each statement is color coded and shows corresponding information. Red represents the use of money. Yellow represents the transfer of money. Green represents money received from the parent.

Balance Sheets

2.8 Financial Lessons

Both parent and child can see financial lesson to learn knowledge about financial literacies.

Lessons categories	Lesson details (e.g. Tips)
Money Jars Financial Lessons General Money Spending Saving Sharing Home Notice Send Statement Lesson	**Money Jars** Financial Lessons Tip #2 Remember to incorporate real money into transactions as much as possible so your child learns that in the digital age of cashless society of debit cards and credit cards, it doesn't mean it's free. You can give your child cash from their money jar, so s/he can use the cash to pay for the item directly while you're with your child. You can take advantage of these teachable moments and teach your child about change (counting and being familiar with physical money), and depositing the change back into the money jar. This suggestion is also part of your child's financial lessons! Back Home Notice Send Statement Lesson

3. Overall Design

The following shows a block diagram which illustrates the overall design architecture of the app. It consists of three sections: *Display and Input*, *Database*, and *Control*. A registered user can be either a parent or a child.
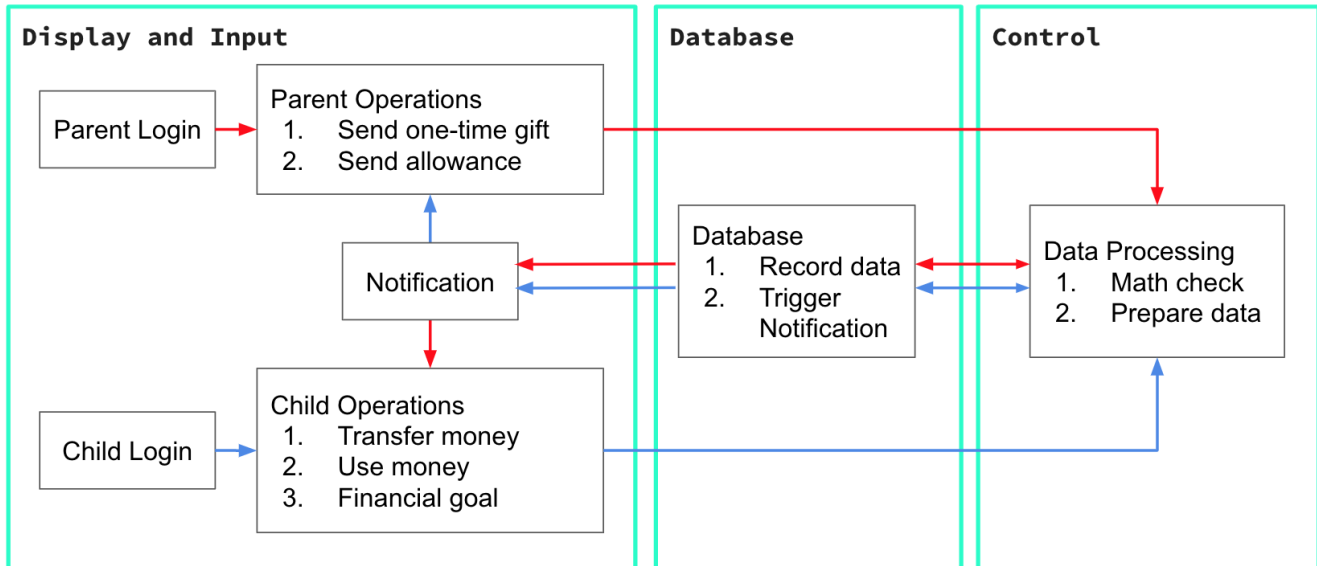
Display and Input section manages all available operations for the user and updates the app display accordingly. It contains five blocks: *Parent Login, Child Login, Parent Operations, Child Operations,* and *Notification*.

- *Parent Login*: This block awaits for parent to login. Inputs for this block are parent's email address and password. This block also manages both parent and child registration.
- *Child Login*: This block awaits for child to login. Inputs for this block are child's username and passcode.
- *Parent Operations*: This block awaits for parent to start an action. A parent can send either one-time gift or allowance to his/her child. Every action taken will trigger *Data Processing* in the *Control* section.
- *Child Operations*: This block awaits for child to start an action. A child can either transfer money between his/her money jars or use to money on purchase or sharing. This block also manages setting up, viewing, and redeeming his/her financial goal. Every action taken will trigger *Data Processing* in the *Control* section.
- *Notification*: This block contains all notifications triggered by an operation. It listens to the database for changes and updates the display accordingly.

Control section manages all the backend tasks for parent/child's operations. It receives requests of operations from parent/child, validates, processes and constructs them into database-formatted bundles. These bundles are then transferred to the *Database* block for further actions. Data may also be read from database before being processed with incoming requests.

Database section manages all data writes and retrievals with Google Firebase. It accepts read requests from *Data Processing* block and writes bundles from it into database. Whenever necessary, it updates

the balance sheets and notification lists in the database, which triggers the listeners in the *Notification* block in *Display and Input* section.

4.   Reflections

Specialist

a) While I was a specialist in finance, I am not a specialist in child financial literacy and underestimated the amount of time required for research. Given the tight timelines of the course, had I known the amount of research required, I would have chosen financial literacy for adults only. In the future, it may be interesting to be able to form groups that allowed specialists to partner with another specialist, so that these multi-disciplinary specialists' groups can be formed.

Programmers

a) Since both programmers are novices to Android programming, we are lacked Java coding experience, and therefore hardcoded a lot of functions redundantly. Sometimes callback functions can be placed parallelly, but we coded in a nested fashion, which made the code less readable. Nevertheless, we learned from online resources on Java coding style, and therefore restructured the code, which was time-consuming. In the future, it will be beneficial to learn more Java coding style before jumping into coding.
b) Throughout development, more new data are incorporated into database. At first, database schema was not designed to be scalable and easily-accessible; instead, everything was hardcoded due to small amount of data. Thus, as data size grows, database became a mess. Approaching end of development, we spent a while on restructuring database so that it became more organized and accessible. In the future, we should think more thoroughly on database structure to avoid unnecessary reconstruction.

5.   Contribution by Each Group Member

Specialist

As the Specialist, I had three major responsibilities:

a) Developed the idea and provided specialist expertise throughout project. This included defining the features and research as they relate to child financial literacy.

b) Acted like the Project Manager including:

    i. Planned, executed and closed the project
- Built a work plan and timeline on GitHub
https://github.com/mie324/MoneyJars/projects
- Created and coordinated deliverables (reports and presentations)
- Tracked issues and progress against project/deliverables deadlines
- Submitted project/deliverables on behalf of the team

    ii. Led the team
- Aligned and motivated my team members with the app vision

- Managed internal and external communication including milestones, challenges, and status updates

b) Provided User feedback
  i. Self-tested the app as both regular and parent user
  ii. Obtained child testing of the app

Programmer (Hao Jin)

As a programmer, the followings are my major responsibilities throughout the project:

a) Responsible for general frontend development. These include basic UI design, UI enhancement, animation design, and how to segment the app into XML layouts to optimize user experience. Basic UI infrastructure is proposed by the specialist, followed by my beautifying and making it more user friendly.
b) Reviewed backend structure and provided feedbacks that improve connectivity to frontend.
c) Optimized backend code to improve timing complexity of several features.

Programmer (Louis Chen)

As a programmer, my major roles in the development process are listed as follows:

a) Responsible for general backend development. These include implementing function handlers from user interactions (clicking buttons, swiping elements, etc.) and determining how the app can be constructed into Java activities. Basic Java activities are constructed according to Hao's UI segmentation. I am responsible for implementing internal helper functions and constructing code format to make it more human readable.
b) Reviewed frontend structure and provided feedbacks that improve connectivity to backend.
c) Constructed database structure such that data is organized for ease of retrieval and management.

6.   Specialist Context

As indicated earlier under the Introduction section of this report there is an urgent need for it as it's a core skill to have in today's complex society. Literature highlights that it's becoming increasingly important that children are taught financial literacy in elementary school, so they can develop healthy habits and attitudes to money early on, especially since it's well established that childhood variables are generally known to have a lifelong impact on the behavior of adults.

Money Jars will successfully teach children about financial literacy and the core values of spending, saving and sharing because it has features that are important for the child's learning, as supported by research on child financial literacy. These features were discussed in detailed under the Introduction section and include parent and child login which promotes interaction and numeracy by having the child to do the math correctly because its high positive correlation with financial literacy. This also included allowing children to make their own decisions like goal setting and determining how to spend one-time gifts. but at the same time recognizing that children focuses on now and therefore need to be guided for savings and sharing behaviors by the parent. Money Jars also provides balance statement to children, because it's important that they understand the implications of their choices. Finally, Money Jars

acknowledges that parents do not have all the answers to financial literacy and needs help so financial lessons/tips are provided to both parent and children.

I believe that if Money Jars was tested on families, financial literacy will improve from current baseline. However, like most behavioral learnings, consistency is important which would still exist if money jars were not digitised and remained physical. Consistency will improve if we incorporated the future work of gamification, improve UI and more relevant lessons/tips.

It is also worth noting that Money Jars was tested on my seven-year old son, and he did find it more engaging and interesting than his physical money jars because he liked that it was now portable (i.e., we didn't have to wait until we got home to update a transaction in the physical jars).

6. Future Work

If work was to continue, we would work on the following to make Money Jars better:

a) Create gamification for a reward system so children can collect points for achieving a goal or doing the math correctly when confirming transactions. Points can be redeemed for playing a game and/or getting a prize to increase children's engagement.

b) Continue to improve user interface by adding more animations and sounds to keep children engaged.

c) Improve financial lessons by providing templates/framework of day-to-day activities, for example, have parent and child plan a trip to the grocery store or do some household budgeting. Real-life context increases relevance for children and will keep them more engaged (Attard, 2018).

7. Permission to Post on Course Website

a) Video of final presentation – yes, all members agree to publicly post
b) Report – yes, all members agree to publicly post
c) Source code – no, all members do not agree to publicly post

Note, source code has been committed to the Money Jars GitHub archive

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